DOCUMENT RESUME

ED 097 012 40 IR 001 194

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TITLE	The Effects of Pictorial Stimuli on Direction Following of Mentally Retarded Adolescents. Project MORE Working Paper No. 300.
INSTITUTION	Kansas Univ., Lawrence. Bureau of Child Research.; Parsons State Hospital and Training Center, Kans.
SPONS AGENCY	Bureau of Education for the Handicapped (DHEW/OE), Washington, D.C.
REPORT NO	MORE-WP-300
PUB DATE	Aug 73
GRANT	OEG-0-71-0449(607)
NOTE	22p.; For related documents see IR 001 192-198
EDRS PRICE	MF-$0.75 HC-$1.50 PLUS POSTAGE
DESCRIPTORS	*Adolescents; Associative Learning; *Exceptional Child Research; Mentally Handicapped; *Pictorial Stimuli; Stimulus Generalization; Verbal Stimuli; Visualization
IDENTIFIERS	Mediated Operational Research for Education; Project MORE

ABSTRACT

Two groups of retarded adolescents were presented sets of multiple verbal directions (imperative sentences). One group was exposed to pictures illustrating the objects and action of each direction in addition to the verbal directions. Subjects were required to carry out performances demanded by the directions. The direction-following behavior of the Verbal + Picture Group was found to be significantly superior to the Verbal Group. The groups did not differ significantly in sequencing their performances, i.e., carrying out the verbal directions in the order in which they were presented. Two possible explanations for the superior performance of the Verbal + Picture Group were offered: (1) pictures provided additional relevant stimuli which strengthened the stimulus-response relation between the spoken directions and the required performances; (2) pictures induced visual imagery which increased associations of the stimuli (pictures and spoken words) and the responses (direction-following). (WCM)

ED 097012

PARSONS RESEARCH CENTER

Working Paper #300 August 1973

THE EFFECTS OF PICTORIAL STIMULI ON DIRECTION FOLLOWING OF MENTALLY RETARDED ADOLESCENTS[1]

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IR001 194

Abstract

Two groups of retarded adolescents were presented sets of multiple verbal directions (imperative sentences). One group was exposed to pictures illustrating the objects and action of each direction in addition to the verbal directions. Subjects were required to carry out performances demanded by the directions. The direction-following behavior of the Verbal + Picture Group was found to be significantly superior to the Verbal Group. The groups did not differ significantly in sequencing their performances, i.e., carrying out the verbal directions in the order in which they were presented. Two possible explanations for the superior performance of the Verbal + Picture Group were offered: (1) pictures provided additional relevant stimuli which strengthened the stimulus-response relation between the spoken directions and the required performances; (2) pictures induced visual imagery which increased associations of the stimuli (pictures and spoken words) and the responses (direction-following).

For the mentally retarded many of the most critical language functions can be subsumed under the category of direction following. With decreased mental abilities, but normal physical abilities, a retarded person may be better able to adapt to the natural and social demands of his environment if he is able to do what he is asked than be able to speak with clarity, precision, and flexibility. The importance of nonverbal receptive language functioning in the retarded, such as following directions and commands, has recently received recognition in several investigations (e.g., Zimmerman, Zimmerman, and Russell, 1969; Whitman, Zakaros, and Chardos, 1971; Lent, Holvoet, Ferneti, Keilitz, and Tucker, in press). Expressive language (verbal) deficiencies have long been a recognized aspect of the behavior of the mentally retarded (Schiefelbusch, 1963; Keane, 1972). Lent et al. have shown, not surprisingly, that retarded adolescents are also deficient in direction-following behavior involving receptive nonverbal language functioning.

The present study was undertaken to determine whether performances carried out in response to verbal directions could be facilitated by the pairing of pictures with the verbal directions. From the standpoint of rehabilitative procedures and methods for effecting behavior change, the use of visual aids held the promise of performance increase. It has been shown that pictures can increase

the performances of mentally retarded individuals in several paired-associates learning tasks. In a comparative study of mentally retarded and normal adolescents, Prehm (1967) investigated the effects of pictures on rote learning performances. It was found that the rote learning performances of the retarded subjects were inferior to those of the nonretarded subjects when the response to be learned consisted of pronouncing or spelling a word. However, when the stimulus was in the form of a picture, the retarded subjects' performances were equivalent to those of the normals. In another comparative study of retarded and nonretarded children, Bruininks and Clark (1972) investigated the effects of auditory (spoken nouns), visual (pictures of nouns), and combined auditory-visual modes of presentation of verbal stimulus materials. Although the overall learning scores of the retarded group were significantly lower than the scores for the nonretarded group, the performances of both groups were significantly better under the visual and combined auditory-visual conditions. The combined auditory-visual condition was higher, but not significantly higher, than the visual condition. Bruininks and Clark (1972) attributed the superior learning performances under the two visual conditions to the "imagery inducing quality of the pictures."

Paivio (1971) has contended that concrete words, phrases, and sentences can be understood and remembered not only verbally but also in the form of "nonverbal imagery." Using Paivio's (p. 450)

example, if a person were told, "The boy is peeling the green orange," his understanding of the sentence would include some kind of mental picture involving the peeling of oranges, and not merely overt or covert rehearsal of the words in the sentence. If he were then asked to remember the sentence, he might do so by recalling the objects and the action involved in the image and somehow forming the sentence from it.

There appears to be empirical evidence and some theoretical support for the effectiveness of pictorial aids in performances involving very circumscribed tasks (i.e., paired-associates paradigm). The purpose of this investigation was to assess the generalizability of these considerations to more "natural" receptive language tasks such as direction following.

METHOD

Subjects

Subjects were 24 institutionalized mentally retarded adolescents classified as mildly retarded (AAMD, 1973). They ranged in chronological age from 12.8 to 19.0 years (mean=16.8 years) with Wechsler Intelligence Scale for Children (WISC) or Wechsler Adult Intelligence Scale (WAIS) scores ranging from 50 to 67 (mean=60). All subjects were ambulatory and exhibited no visual or auditory deficiencies.

Materials

Ninety-five common objects and toys (e.g., fork, spoon, car, airplane) were used as referents in the verbal directions. Only

those objects pertaining to the verbal directions presented in each session (19 objects per session) were located on a 36" x 60" display unit. The display unit contained five shelves of varying depths permitting maximum visibility of objects and toys on each shelf.

The directions consisted of 300 sentences in the imperative form which were generated from 9 verbs, 10 prepositions, 12 adjectives, and 95 nouns corresponding to 95 objects and the directed performances involving those objects. All nouns, verbs, adjectives, and prepositions utilized in the directions are listed in Table 1. Sentences had one of three basic forms: (1) verb (or verb phrase) +

Insert Table 1 about here

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determiner + noun (e.g., Point to/the/tiger); (2) verb (or verb phrase) + determiner + adjective + noun (e.g., Give me/the/green/marble); (3) verb (or verb phrase) + determiner + noun + preposition + determiner + noun (e.g., Put/the/dog/in front of/the/horse). The 300 sentences were distributed into 100 sets, each set containing three sentences. Each of the three sentence forms was represented in all the sets with the less complex sentence form preceding the more complex sentence form. A single imperative sentence defined one direction.

The 300 directions were individually illustrated by color photographic slides depicting the objects and action representing each

verbal direction. For example, the direction "Point to the blue airplane" was represented by a slide depicting the model's index finger extended and touching a blue airplane located adjacent to two other airplanes of different colors. Only the hand and the lower arm of the model was shown in all the slides. A Kodak Carousel slide projector, Model 800, was used to present the slides.

Pretest

A pretest was conducted to ensure that all lexical items used in the directions were "understood" by all subjects. The subjects were shown all objects used in the experiment. The pretest for nouns and adjectives was accomplished by requiring the subjects to point to those objects which were named (in the case of nouns) or objects which possessed those attributes (in the case of adjectives) mentioned by the experimenter. Verbs and prepositions were tested by requiring subjects to perform the appropriate action or indicate the correct position (e.g., in, next to, under) designated by the experimenter. All lexical items used in the directions were presented to all subjects in this fashion.

Three subjects failed to correctly identify all the lexical items upon their initial presentation. These subjects were dropped from the study. Two additional subjects were pretested. After correctly identifying all the lexical items, one subject was arbitrarily selected and dropped from the study in order to maintain an even number of subjects for statistical convenience.

Subjects were seated in a chair located at the side of the unit displaying the referent objects used in direction-following performances. Closed sides of the unit blocked visibility of the objects during direction presentations.

Each subject's direction-following performances was observed and scored by the experimenter. During sessions selected at random an observer simultaneously but independently of the experimenter observed and scored each subject's performance. No systematic reinforcement was provided. Noncontingent favors (e.g., candy bars, gum, and verbal expressions of appreciation) for participation were given to subjects at the end of each session.

RESULTS

Reliability

Data collected by the observer were utilized for assessment of interobserver reliability of recording only. Agreements between the experimenter (the prime observer) and the observer were defined as instances when both agreed in scoring a single direction-following performance as either correct or incorrect; conversely, disagreements were instances in which observers disagreed in scoring performance either correct or incorrect. Reliability percentages, computed by dividing the number of agreements by the number of agreements plus the number of disagreements per session, ranged from 80 to 100 percent with a mean of 97.9 percent.

Correctness

Figure 1 shows the number of correct responses to directions for the two groups on each of the ten sessions. Points plotted

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Insert Figure 1 about here

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represent group means calculated from individual session scores. As is evident in Figure 1, the Verbal + Picture Group performed a greater number of directions correctly than the Verbal Group over all the ten sessions. The Verbal Group consistently fell well below 20 correct direction-following responses out of 30 possible responses; the Verbal + Picture Group maintained an average near 25 over the ten sessions. A slight decrease in the number of correct responses over sessions can be ascertained for the Verbal Group. The almost horizontal curve depicting the performance of the Verbal + Picture Group suggests no such decrease in this group. A 2 x 10 (Groups x Sessions) analysis of variance revealed a statistically significant main effect of groups, $F(1,20) = 17.69$, $p < .001$ and sessions, $F(9,180) = 3.37$, $p < .001$, but no significant Groups x Sessions interaction, $F(1,180) = 1.51$, $p > .10$.

Sequence

The sequence in which the directions were performed, either correctly or incorrectly, was scored in terms of an index reflecting the extent of deviation from the presented sequence of directions within each set. An incorrect performance of a direction was defined as

direction-following responses in which the correct object but incorrect action or the correct action but incorrect object required by the presented verbal direction were carried out by the subjects. Any responses other than a correct or incorrect performance were not scored. A score was recorded for each direction carried out only if it was preceded by another performed direction which was presented earlier in the sequence. For example, a three-direction set sequenced in the order 1, 2, 3, as presented, was given the maximum score of 2 + 1 = 3 indicating that two direction-following performances (2 and 3) occurred later in the sequence than Direction 1, and that Direction 3 occurred, as presented, later in the sequence than Direction 2. A direction set sequenced in the order 1, 3, 2 was scored 2 + 0 = 2 indicating that two performances (3 and 2) were performed as presented later in the sequence than Direction 1, but that Direction 2 was carried out only after Direction 3 was carried out, i.e., not in the order it was presented.

The mean sequence scores for the two groups for the ten sessions are graphically depicted in Figure 2. The Verbal + Picture Group

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Insert Figure 2 about here

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apparently carried out more of the directions in the sequence in which they were presented than the Verbal Group over all ten sessions. These differences in sequencing of direction-following performances, however,

Procedure

Subjects were randomly assigned to two groups, Verbal + Picture and Verbal, with 11 subjects in each group.

At the start of the first session subjects in the Verbal + Picture Group were instructed to "...do what I (the experimenter) tell you to do and what the pictures show you to do." Subjects in the Verbal Group were instructed simply to carry out the performances demanded by the verbal directions presented. Both groups were instructed to initiate their performance at the end of a direction set (i.e., block of three directions) signaled by a prompt ("Go ahead") given by the experimenter. Directions were presented in a normal conversational tone; each direction was spaced to begin and end within 5.0 seconds, such that a direction set presentation (including the prompt) lasted approximately 15 seconds. No time limit was placed on the subjects' performances.

In addition and simultaneous with the verbal directions, the Verbal + Picture Group was exposed to color photographic slides depicting the performances demanded by the verbal directions. Simultaneous with the initiation of each spoken direction, slides representing the directions, were projected onto a 18" x 24" screen seven feet directly in front of the subjects. Each slide was presented for 5.0 seconds. Projection of the slides was terminated, leaving only the blank screen, at the end of a direction set presentation.

were not statistically reliable. A 2 x 10 (Groups x Sessions) analysis of variance of the sequence index scores revealed no statistically significant effects of Groups, Sessions, or Groups x Sessions.

DISCUSSION

For the mentally retarded adolescents in the present study, direction-following behavior was clearly facilitated when the verbal presentation was supplemented with correlated pictorial materials. These results generally parallel and extend into applied situations studies in which pictorial stimuli and combined auditory-visual modes of presentation were shown to lead to superior performances in paired-associates tasks than auditory presentations alone (Prehm, 1967; Bruininks and Clark, 1972).

In the first session, the Verbal + Picture Group performed 23.8 or 79 percent of presented directions correctly while the Verbal Group performed 17.9 or 60 percent of the directions correctly. These results prove interesting when compared with the performance of the retarded group of adolescents in the comparative study reported by Lent, et al. (in press). Retarded adolescents in this study were presented 18 verbal directions almost identical to those presented the Verbal Group in the present study. Their correct direction-following performance, in terms of a group average, was 65 percent or only slightly superior to the Verbal Group but still inferior to the Verbal + Picture Group in the first session of the present study. The only apparent

procedural difference between the present study and that of Lent, et al. appears to be the use of tokens (exchanged for pennies after the session) contingent on correct responses by Lent, et al. This suggests that any additional control of direction-following behavior exerted by contingent reinforcement may be negligible when such behavior is already largely under the control of verbal directions. In an unpublished study (see, Keilitz and Lent, 1973) we confirmed this suggestion that the effects of a token reinforcement procedure on multiple direction following in mentally retarded individuals may be minimal. The implications of this consideration, especially in view of the significant facilitory effects of pictorial stimuli on direction following in this study, are not quite clear. Perhaps, from the standpoint of effective training programs aimed at the improvement of verbal direction following, more emphasis needs to be placed on the design of antecedent events (i.e., supplemental visual materials) and less on the manipulation of consequences (i.e., reinforcement) of direction-following behavior. Once a stable level of performance has been established, however, the problem of maintenance of that level may well become one of management of contingent consequences (cf., Zimmerman, Zimmerman, and Russell, 1969).

Although the subjects were not explicitly instructed to carry out the directions in the order they were presented, the lack of any significant difference in sequencing between the two groups seems noteworthy. Apparently supplemental pictorial stimuli enhance correct

performance without dramatically affecting the order in which the directions are carried out. A possible explanation may be that the pictures contained relational information that served to strengthen associations formed between actions and objects within single directions, thereby facilitating correct performance of that direction, while leaving any associations between separate directions unaffected. This explanation is plausible since the pictures were presented for the same length of time and simultaneous with the verbal directions. The possibility exists that a simultaneous presentation of three pictures in some spatial arrangement corresponding to and overlapping with successive verbal presentations of a set of multiple directions might well facilitate sequencing, as well as correct performance. In such a combined auditory-visual arrangement the separate directions may be linked in a spatial configuration which could enhance association of the directions and thus facilitate sequencing.

Direction-following behavior may be regarded broadly as a type of stimulus-response relation in which the controlling stimuli are spoken directions. One possible explanation for the superior direction-following performance of the Verbal + Picture Group as compared to the Verbal Group is that the pictures provided additional functionally equivalent or relevant redundant stimuli which strengthened the stimulus-response relation between the spoken directions and the required performances. Furthermore, since the direction-following response itself requires no verbal output, pictorial stimuli controlling specific

responses may have allowed the bypassing of verbal information acquisition altogether. That is, it is conceivable that simple imitative responses to pictures may have facilitated the performance of the Verbal + Picture Group.

A considerable body of research admirably reviewed and integrated by Paivio (1971) seems to leave little doubt that procedures designed to encourage greater visual imagery (mental images) can have dramatic effects on learning and recall. An explanation for the present results, somewhat more speculative than the relevant redundant stimuli explanation, is that pictorial stimuli induced visual imagery which increased associations of the stimuli (pictures and spoken words) and the responses (direction-following). Clearly, if the directions in the present study were more "vividly" remembered and associated with the referent objects and actions, it would seem that the subjects' performances would be enhanced.

It seems reasonable to assure that nonverbal receptive aspects of language, such as direction following, play a crucial role in the communication of mentally retarded individuals. Moreover, it may be argued that their environment is often so constructed that such aspects are more crucial to the retarded person than the nonretarded person. The present results suggest that pictorial presentations may be particularly effective in remediation of deficiencies in nonverbal aspects of language. From a broader educational viewpoint, these results suggest that instructional programs be designed to include, as much as possible, the use of pictorial aids.

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Footnote

[1]This research was supported by a grant (HD 00870) from the National Institute of Child Health and Human Development. The authors are grateful to the Project MORE Media Support Services, Bureau of Child Research, University of Kansas for photographing and printing slides for the study.

TABLE 1

LIST OF SENTENCE COMPONENTS

Nouns				
pen	towel	flag	envelope	toothbrush
dishrag	rabbit	ribbon	sheep	car
lighter	eggbeater	elephant	angel	key
ashtray	screwdriver	banana	cowboy	safety pin
coloring book	house	lightbulb	belt	pocket knife
button	comb	shoe	purse	Indian
penny	lipstick	thread	toolbox	crayons
basket	gun	leaves	watch	cow
horse	boot	corn	hat	magazine
Kleenex	hammer	saw	pear	pan
marble	orange	mirror	tomato	paper
airplane	ring	toilet paper	carrot	plate
dog	tablet	washrag	tractor	toothpaste
tiger	boat	coat	spider	ball
scissors	dice	zipper	pliers	ruler
fork	apple	saltshaker	axe	cup
chain	padlock	flashlight	spool	handkerchief
block	pig	sack	glasses (eye)	grapes
rubber band	glass (drink)	bandaid	sock	spoon

Verbs	Adjectives	Prepositions
fold	large	in
give me	blue	next to
pick up	black	under
cut	little	inside
point to	pink	over
hand me	yellow	in front of
turn over	small	behind
open	two	on
close	one	beside
	big	above
	green	
	white	

Figure Captions

Fig. 1. Mean number correct responses for the Verbal + Picture and Verbal groups performing multiple directions in sets of three directions over ten sessions.

Fig. 2. Mean sequence scores for the Verbal + Picture and Verbal groups performing multiple directions in sets of three directions over ten sessions.

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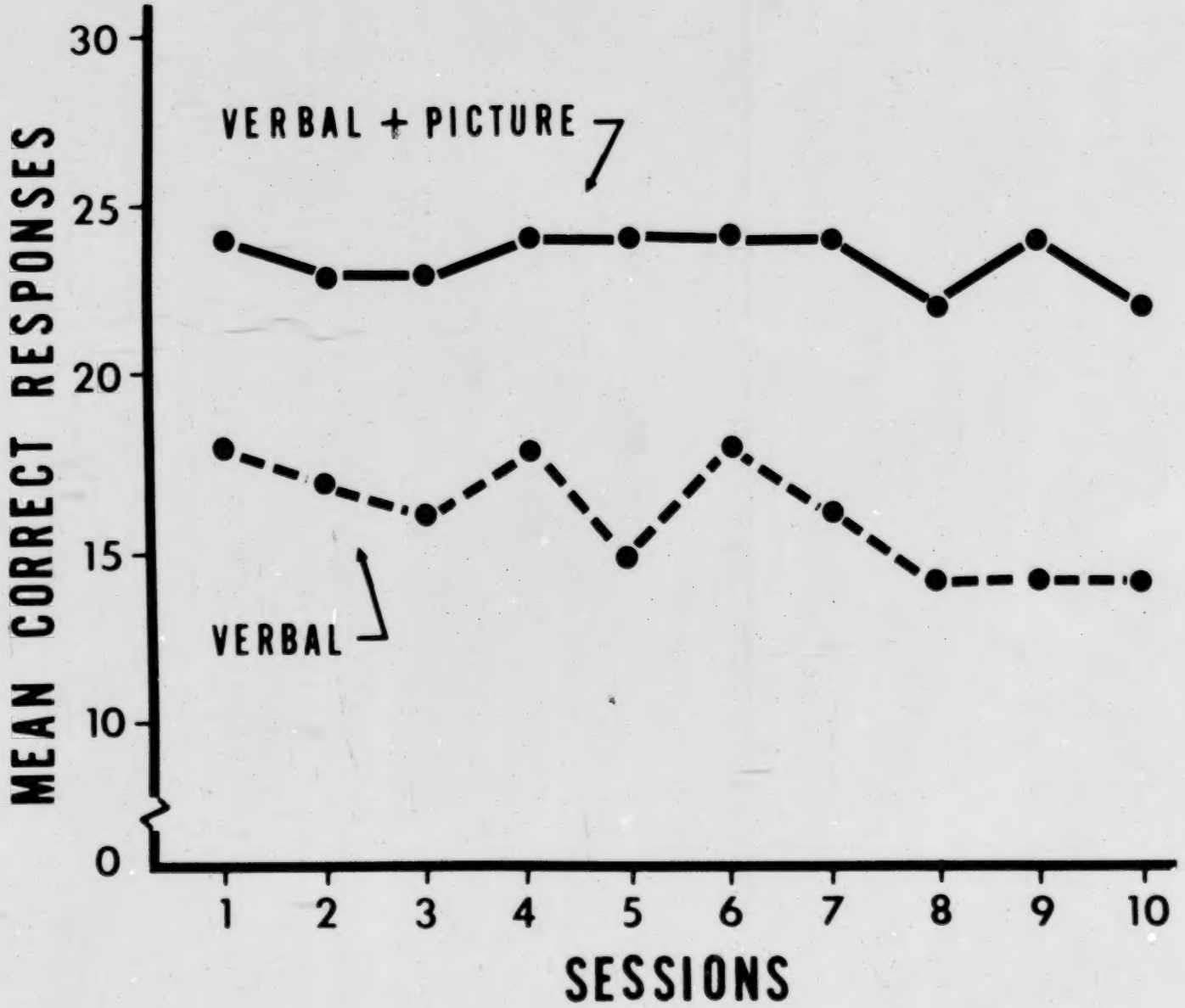

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